

A MINE AS AN OBJECT OF CRISIS MANAGEMENT

Maja TARASZKIEWICZ-ŁYDA*

* Department of Mining Management and Safety Engineering, Faculty of Mining and Geology,
Silesian University of Technology
e-mail: maja.tarasziewicz-lyda@polsl.pl

Received on 11th April ; accepted after revision May 2017

Copyright © 2017 by Zeszyty Naukowe WSOWL



Abstract:

The article deals with problems connected to crisis management regarding mining companies. In accordance with adequate decrees, mining companies, including mining plants, belong to objects towards which crisis management rules should be applied. In mining plants, apart from underground threats, ground threats that lead to a crisis situation might also emerge on the entrepreneur's territory. By this reason, they should be guided by the principles for the preparation for their special protection through conceptual, planning, organizational, logistic, technical, training and control activities taken to develop, agree and update specific protection plans, implement projects under the alert and notification system, and exchange information on threats. A summary of possible hazards to a particular site and a separate mining plant facility, assessment and risk control are essential to develop a safety concept and prevent risks. There is a need of continual analyses of potential threats and actions taken to eliminate them, and if they occur the rapid response of individual services and appropriate integrated rescue operations.

Keywords:

crisis management, safety of mining work, mining, risk assessment

INTRODUCTION

The main aim of this paper is to establish a method that allows for the identification of mine crisis infrastructure objects (significant for: safety of workers hired in underground objects, surface objects, people living in the external territory of a mine and efficient functioning of mines in risk situations posed by crisis threats) as well as their classification in order to carry out the risk assessment posed by crisis threats. Moreover, the paper attempts to propose a model of crisis risk assessment in mines, adjusted

to conditions of mines security management and requirements of crisis management on the local level.

Research methods used in this article: techniques of survey research, technique of group opinion polls of experts as well as mathematical methods.

The structure of the article: the article consists of the introduction that describes the aim and the research methods, two chapters and the conclusion based on the conducted research as well as the bibliography.

One of the main tasks of the government and local government administration is to have organizational and legal solutions, structures and instruments allowing for efficient management in case of a crisis situation.

The tasks include, among others, preventing a crisis situation from developing.

In the crisis management system on the local government level, communes conduct basic tasks, which regard monitoring, warning and alarming as well as planning, responding and removing effects of threats in their areas. The statement of possible threats for a particular area (including mining plants) and the assessment and control of risks are crucial for developing the safety concept and preventing threat situations.

In accordance with adequate regulations, mining companies, including mining plants, belong to objects towards which rules of crisis management are applied. Planning of crisis response is also applied to them due to the possibility of occurrence of threats and crisis situations on their territory.

One of them is the Regulation regarding objects that are especially important for the safety and defensive capability of the state as well as their special protection [6].

The list of these objects is determined by the Council of Ministers. The Chief of the Chancellery of the Prime Minister, ministers, chairmen of committees that are a part of the Council of Ministers, provincial governors, the president of the National Bank of Poland and the president of the National Development Bank can request to recognize an object as important for the safety and defensive capacity of the state.

The Regulation by the Council of Ministers defines special objects important for the safety and defensive capacity of the state, the categories as well as tasks in terms of the special security and adequateness of organs in such issues.

Objects are grouped into two categories.

The examples of objects in the category II of especially important objects for the safety and defensive capacity of the state include, among others:

- objects of organizational organs and units subject to the Minister of Public Administration or those supervised by him/her;
- objects of organizational organs and units subject to the Minister of Internal Affairs or those supervised by him/her;
- plants that have a direct connection with the extraction of basic minerals;

- objects in which materials posing a particular explosive or fire threat are produced, used or stored;
- objects in which conducted operations include the use of toxic chemical compounds and their precursors as well as biological, microbiological means, microorganisms, toxins and other substances causing illnesses of people and animals;
- power plants and other power supply objects;
- other objects in the possession of administrative organs, organs of local government units, formations, state institutions and entrepreneurs as well as other organizational units; the destruction or damage of which might pose a danger to the health and life of people, national legacy and the environment to a large extent or create serious material losses and interrupt the functioning of the state;
- objects of organizational units of the Internal Security Agency;
- objects of the Police, the Border Guard and the State Fire Service;
- objects belonging to the Minister of Justice, the Prison Service and units subject to or supervised by the Minister of Justice.

In accordance with the aforementioned Regulation, corporations and mining plants belong to this group of objects. Therefore, rules regarding the preparation of the special security through conceptual, planning, organizational, logistic, technical, training and control work are applied to them. It is done, among others, in order to develop, decide on and update plans of the special security as well as to carry out projects within the alert and notification system and exchange of information about threats.

1. CRISIS MANAGEMENT AND A CRISIS SITUATION

In order to minimize the effects of threats, it is crucial to identify and analyze potential risks as well as to apply appropriate rescue measures (creating communal, district and provincial plans of crisis management).

Therefore, in the case of a crisis situation in the mining plant area, according to the Regulation and the Act on crisis management, rules regarding crisis management must be implemented.

Particular authority bodies, the armed forces, services, guards and inspections conduct independently and jointly prescribed tasks in the scope of security according to algorithms and standard procedures of management (leading, commanding).

However, there are situations when a real control over events is lost, routine actions prove insufficient, decision-making processes are disrupted, events proceed responses, there is a deficit of information and authorities need to implement the so-called short-term planning connected with decision-making and activities, or, in other words, crisis management. There are different views relating to the definition of crisis management. In the literature, a whole set of definitions regarding the examined problem can be found:

- “a decision-making process leading to choosing a rational strategy to counteract real and/or potential crisis situations; manner of management of specific resources of the system ensuring the return to the normal state from the crisis state or maintaining this state despite the occurrence of symptoms of a crisis situation” [7];
- “reacting to an upcoming or present crisis and removing its effects in the cycle of events and activities, from anti-crisis predicting and planning accompanied by responding to everyday events to finishing the process of reconstruction (preparing, reacting, rebuilding)” [4];
- “a group of organizational, logistic and financial projects, the aim of which is to prevent the emergence of crisis situations, to ensure the efficiency of decision-making structures on all levels of management, to maintain the continuous readiness of forces and means to take action, to efficiently react and remove causes of the occurring situation” [3];
- “the entirety of systemic solutions in the scope of population protection, conducted by public authorities on all levels, in collaboration with specialized organizations and institutions, in order to prevent difficult and dangerous situations that threaten the life, health, property, environment and infrastructure; preparing the response system as well as shaping and controlling the course (response) of threats in case of their occurrence in a way that ensures minimizing of losses and an acceptable level of safety as well as rebuilding of social structures after a catastrophe” [1];
- “the entirety of systemic solutions in the sphere of population protection, filled by public authorities on all levels, in collaboration with specialized organizations and other entities in order to prevent difficult situations that create a threat to the life and health of citizens as well as the environment” [10];
- “a process of leading in the country in order to prevent crisis situations and in case of their occurrence – reversing the direction of the development of sudden and dangerous events threatening the vital interests of the society” [9].

The Act on crisis management introduced the universal definition of crisis management which goes as follows: “the activity of public administration bodies that is an element of managing the national security, which consists in the prevention of crisis situations, preparation to take control over them in the scope of planned activities, responses to crisis situations, removal of their effects and reproduction of resources and critical infrastructure” [8].

A crisis situation, however, can be defined as: “a state of growing destabilization, uncertainty and social tensions, characterized by the infraction of social ties, possibility of losing control over the course of events as well as the escalation of threats, especially of a situation that creates danger for the life, health, property, cultural heritage or critical infrastructure, including one caused by events of a terrorist character” [5].

Crisis situations arise in case of:

- a disruption to public order;

- terrorist activities;
- as a consequence of natural disasters or technical failures;
- as a consequence of biological hazards;
- a threat to the citizens' safety or the constitutional system;
- an internal threat to the state security.

A crisis situation might arise as a result of the forces of nature, environmental elements and human activity. The key moment is the recognition of the occurrence of a given situation.

2. OBJECTS AND SYSTEMS OF MINES OF A KEY MEANING FOR MINERS' SAFETY AND FOR EFFICIENT FUNCTIONING OF A MINE, OBJECTS OF HIGH RISK

It should be remembered that in a mining plant, despite threats that occur underground, those causing crisis situations in the area belonging to an entrepreneur might also arise. Together with the civilization development, the number of factors generating threats still grows. There is a need for constant analysis of potential threats as well as taking actions to eliminate the possibility of their occurrence, and in case of their emergence a quick response of particular services and adequate management of rescue operations. Mines belong to objects that need to be considered when planning crisis responses due to the possibility of the occurrence of threats and crisis situations on their territory. The components of such plans are, among others, lists of possible threats for a given area (including mining plants), risk assessment of the threat occurrence or rescue responses procedures, and in case of the territories belonging to the Mining Plants - in cooperation with ground units of the National Firefighting and Rescue System.

Furthermore, based on the Act on the provincial governor and the government administration of provinces, the Act on the crisis management, the Act on the universal obligation to protect the Republic of Poland, the Regulation of the Council of Ministers on the detailed range of competences of the Head of the National Civil Defense, heads of the civil protection in provinces, counties and communes, the Regulation was issued by the Provincial Governor of Silesia regarding the assurance of the consistency of action in case of mass events or industrial disasters, including events linked to bomb incidents or terrorist attacks. Therefore, it obliges entrepreneurs (including mining companies) to implement the rules identified in the framework procedure "Entrepreneurs' activities in case of a mass accident or industrial disaster". Thus, there exists the requirement to conduct trainings on the territory of a mining plant during simulated rescue actions involving ground rescue units. Experiences gained during this type of stimulations are of great importance for the required procedure during real rescue actions, as they increase the level of safety and minimize the effects of industrial disasters.

At the same time, other factors that should be considered include: the necessity to prepare solutions in case of destruction, failures, attacks and other events disrupting the regular functioning of mining infrastructure, aiming at ensuring the functionality,

continuity of actions and integrity in order to prevent threats, risks or weak points as well as limiting and neutralizing them and quick reconstruction of the infrastructure.

The development of a model allowing to distinguish objects and systems belonging to the mining infrastructure that are of key importance for the security, will make it possible to direct attention to objects of high risks and develop a map of mine crisis risk, which will also help to differentiate zones that may become the field for actions of ground rescue services, establish expected variants and operation procedures as well as put together the planned forces and means in order to use them in crisis situations.

The plan foresees the evacuation organization, logistic support, and medical care and psychological assistance. It also determines principles and procedures for entities in the scope of preventing and removing effects.

The cooperation of the managers and decision makers of a mining plant (due to the lack of power and own measures to remove various threats listed in i.e. safety nets) with the rescue units of the Firefighting and Rescue System is an integral element for ensuring safety of people working in Mining Plants when a crisis situation is occurring in ground buildings among others. Additionally, the provincial government requires the implementation of the rules of conduct in the Mining Plant during the rescue action after a mass accident or an industrial catastrophe that threatens the life of people, the environment and has features of a crisis situation, which therefore also influences the necessity for collaboration of rescue system units with mining units. Procedures that are in force during rescue operations concern both a entrepreneur (in this case the mining company) and other units of ground rescue services.

The first stage of the research and model development starts from conducting surveys among experts. Experts are asked to fill out a questionnaire, in which objects that might potentially be qualified as the so-called mine crisis objects (preliminary collection) are listed, since they are crucial for the miners' safety and lives, for the efficient functioning of mines as well as those objects for which developing risk maps is justified in association with the needs of rescue plans and crisis management. Objects are chosen based on the threat criteria specified in legal acts regarding crisis management, which might contribute to the occurrence of a crisis situation in a specific ground infrastructure object and at the same time escalate the need to use forces and means of ground rescue units. They are also chosen based on their position and localization. Objects localized in the mine area are important to a large extent, due to the possibility of being considered in the crisis management plan as well as the plan for disposing ground rescue units within the firefighting and rescue system. It is done in contrast to underground threats where the mine rescue functions according to guidelines for the mining plant rescue plan. The task of the experts is to assign particular objects to the assessment of their damage effects on the safety, life and health of miners as well as on the efficient functioning of a mine. The quality categories are used, such as: little importance, medium importance, and great importance. The following objects are listed in the questionnaire:

Table 1. Mine objects

No.	Object
1.	Winding machine
2.	Shaft house
3.	Gallows frame
4.	Main compressor station
5.	Compressed air pipeline
6.	Processing objects
7.	Power stations
8.	High and medium voltage grid
9.	Main drainage installation
10.	ICT center and control room
11.	Fire fighting storage tank
12.	Pipe-and-cable tray rack
13.	Technological bridges
14.	Proppant objects
15.	Dredging spoils storage yards
16.	Industrial water pipeline
17.	Headquarters, administration
18.	Baths
19.	Warehouse and workshop objects
20.	Heating network
21.	Internal company roads
22.	Water and sewage system
23.	Railway siding
24.	Central strainers of underground water
25.	Main shaft
26.	Air shaft
27.	Main fans
28.	Rescue-medical object
29.	Flammable materials storage

Source: own study

Additionally, it is possible to add an object that has not been listed in the Table above and in an expert opinion it should be qualified as an object particularly significant for safety and for which it would be reasonable to create risk maps in order to have it placed in the crisis management territorial plan.

In order to compare 29 objects characterized by different assessments, weight can be given to particular levels of importance (little, medium, great), while “total importance” of an object can be determined by an appropriate weighted average.

On this basis, objects are divided into two groups. The first one consists of objects that potentially belong to crisis objects, for which it is reasonable to draw up a crisis management plan.

After conducting further survey research (every expert receives a special elaboration of the Card of the Risk Assessment of Causes and Effects of a Crisis Situation for each threat in particular mine objects) and based on the calculations, the possibility of occurrence of a particular threat in mine objects and the possibility of occurrence of a threat to safety of a mine that is conditioned by potential effects of a crisis situation ascribed to a particular crisis threat are obtained. Threats are closely linked to dangers listed in crisis response plans of provinces, counties and communes: natural disasters (including floods), fire threats, threats of major construction accidents, serious failures of communication and notification systems, including dispatch systems, acts of terror and social incidents and a risk of a major power supply failure. Effects of crisis threats, however, are classified as critical, substantial or slight.

At this stage, the method of a group expert opinion is used. The procedure is based on evaluating threat features by analyzing their subjective likelihood, being the expression of the expert group judgment. In the assessment, they use empirical information gained in the past, in situations similar to the one in question, data gained currently and their own experience, common sense and intuition [2]. In order to study the statistical compatibility of the expert judgment, an indicator called the Kendall coefficient of concordance is used. What is more, the activity rate and the expert competency rate are calculated.

Respectively, crisis risk indicators for every crisis object in a mine are determined. Based on the risk criteria, objects of high and medium risk are identified. These objects are located on the map and crisis risk maps are developed as an element of a crisis response plan.

In order to minimize effects of a number of threats, it is crucial to identify and analyze potential threats as well as to apply adequate rescue measures (creating communal, county and provincial plans for crisis management). Therefore, in case of a crisis situation occurring on the territory of a mining plant, in accordance with the Regulation and the Act on crisis management, principles regarding crisis management have to be implemented.

The plan and program of crisis response (procedures) are created in association with the conducted research and obtained results.

Procedures and operational-rescue actions deal with ground systems and objects in mines with the participation of ground rescue services belonging to the National Fire-fighting and Rescue System in case of threats included in the crisis response plans and disposal of appropriate forces and means depending on the threat. The aim of the procedures is to establish rules and the way of operating for entities in the scope of removing effects of threats, ensuring systematic, coordinated and effective responses to crisis events as well as determining the responsibility of the local administration and other institutions while conducting the crisis response operations. All procedures are implemented with the participation of the mine headquarters and decisive persons from particular departments of a given mining plant.

CONCLUSIONS

The conducted research proved that the applied techniques and mathematical methods allow for the development of a complex and logically consistent model for identifying objects of mine crisis infrastructure, as well as the development of risk categories. Due to the delineated crisis risk indicators for each mine critical object and based on the risk criteria, objects of high and medium risk can be determined. Particular objects are located on the map and mine risk maps are developed as an element of a crisis response plan. Simultaneously, spheres that will become the action field for the ground rescue services can be identified, the expected variants and action procedures established, forces and means that are planned to be used in crisis situations put together (the organization of evacuation, logistic support, the organization of medical care and psychological help are foreseen in the plan, as well as the rules and ways of operation of entities are established in the scope of preventing and removing effects). The identification of crisis infrastructure objects is substantial for organizing the work of ground rescue services and also for preparing appropriate forces and measures in mines to apply in crisis situations.

The work concerns the considerable safety area; therefore it requires further research also in the field of law requirements of the EU. In the future, the research results need to be taken into account in the established Crisis Management Plans, especially the procedures of crisis threat identification and crisis response procedures developed by mining plants. Furthermore, the Mine Average Crisis Risk Indicator can be specified, which might constitute the basis for the classification of mines as well as their objects to categories of crisis situation occurrence risk.

REFERENCES

1. Gołębiowski J., *Zarządzanie kryzysowe*, [in:] "Wiedza obronna" 2001.
2. Krzemień S., *Zastosowanie procedury formalizacji ocen ekspertów w diagnozowaniu zagrożeń górniczych*, Wyd. Politechniki Śląskiej, [in:] "Zeszyty Naukowe", nr 1178, Gliwice 1992.
3. Ladak D., Pilch T., *Elementarne pojęcia pedagogiki społecznej i pracy socjalnej*, Wydawnictwo Żak, Warszawa 1999.

4. Pawłowski J., *Słownik terminów z zakresu bezpieczeństwa narodowego*, AON, Warszawa 2002.
5. Projekt poselski ustawy o bezpieczeństwie obywateli i zarządzaniu kryzysowym, Warszawa 30 kwietnia 2004.
6. Rozporządzenie Rady Ministrów z dnia 24 czerwca 2003 r. w sprawie obiektów szczególnie ważnych dla bezpieczeństwa i obronności państwa oraz ich szczególnej ochrony (Dz.U. nr 116 z 2003 r. , poz. 1090).
7. Sienkiewicz P., Górny H., *Analiza systemowa sytuacji kryzysowych*, AON, Warszawa 2002.
8. Ustawa z dnia 26 kwietnia 2007 r. o zarządzaniu kryzysowym, Dz. U. 2007, Nr 89, poz.590 z późn. zm.
9. Wróblewski R., *Zarys teorii kryzysu, zagadnienia prewencji i zarządzanie kryzysami*, AON, Warszawa 1996.
10. Zieliński K., *Bezpieczeństwo obywateli podczas kryzysów niemilitarnych oraz reagowanie w razie katastrof i klęsk żywiołowych*, AON, Warszawa 2004.

BIOGRAPHICAL NOTE

Maja TARASZKIEWICZ-ŁYDA – PhD., Assistant Professor at the Department of Mining Management and Safety Engineering, Faculty of Mining and Geology, Silesian University of Technology; graduate of the Silesian Medical Academy, doctoral studies at the Silesian University of Technology; expert in the field of rescue and public health. Areas of interest: medical rescue, industrial and mining rescue, crisis management, organization of emergency rescue systems, safety.

HOW TO CITE THIS PAPER

Taraszewicz-Łyda M., (2017)., A mine as an object of crisis management. *Zeszyty Naukowe Wyższa Szkoła Oficerska Wojsk Lądowych im. gen. Tadeusza Kościuszki Journal of Science of the gen. Tadeusz Kosciuszko Military Academy of Land Forces*, 49 (3), p. 44-53, DOI: 10.5604/01.3001.0010.5121



This work is licensed under the Creative Commons Attribution International License (CC BY).
<http://creativecommons.org/licenses/by/4.0/>